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ANALYSIS
OF THE COST OF
LATE CONTRACTOR DELIVERY

SEPTEMBER 1987

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FOREWORD

The Defense Logistics Agency (DLA) Directorate of Contracting
requested DLA's Operations Research and Economic Analysis Office, DLA-
LO, to quantify the costs incurred by DLA as a result of late vendor
delivery. This report documents and summarizes the efforts and
conclusions reached in this analysis.

The costs of late delivery for items managed at the Defense General
Supply Center (DGSC) were found to be approximately $11 for the effort
and materials expended in the attempt to expedite delivery of the
contracted assets and $314 for the increased safety levels which must
be purchased and maintained as a result of the late delivery. These
costs represent about six percent of the contract value for a typical
DGSC late delivery. Two approaches were suggested which have the
potential to reduce or recover the costs incurred by DLA because of
late vendor delivery.

The primary recommendation is to test the application of this cost of
a late delivery in a sample of a center's contracts as soon as
possible.

ROGER C. ROY
Assistant Director
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EXECUTIVE SUMMARY

The Packard Commission has recommended that the government manage its purchasing operations more like the private sector by emphasizing quality and schedule in addition to price. The Defense Logistics Agency's (DLA) Directorate of Contracting is examining the possibility of quantifying the costs associated with poor contractor performance and incorporating these costs into the bid evaluation process. The DLA Operations Research and Economic Analysis Office (DLA-LO) has been tasked with evaluating the cost of late vendor delivery.

This study examines the costs of late vendor delivery for items managed at the Defense General Supply Center (DGSC). Both the direct costs of late delivery which include the labor and material expended in the attempt to resolve the situation, and the indirect costs which include the maintenance of increased safety levels of materiel because of increased lead times, are addressed by this analysis.

The cost of a typical late delivery to DGSC has been quantified by this analysis to be approximately $11 in labor and materials used to expedite delivery of the materiel, and $314 in increased safety levels and maintenance of this materiel. These costs of late delivery represent approximately six percent of the typical replenishment contract cost.

Two approaches for the application of the costs of late delivery to the contracting function have been proposed in this study to reduce the overall cost to DLA in the purchase of materiel. The first approach is to use the costs of late delivery in conjunction with contractors' performance histories in the bid evaluation process to assign premiums/penalties which can be used to offset each contractor's bid. The second approach is to assess liquidated damages against contractors who deliver late using the costs of late delivery developed in this effort.

We recommend that one or both of the proposed contracting approaches be tested at DGSC to evaluate the feasibility of using late delivery costs to reduce the overall cost to DLA for materiel purchases.

I. INTRODUCTION

A. <u>Background</u>. One recommendation from the Packard Commission's study on Defense management was that the government should buy more like the private sector, emphasizing quality and timeliness as well as price. The Defense Logistics Agency's (DLA) Directorate of Contracting is examining ways to implement this recommendation by including consideration of contractor performance in the bid evaluation process. Generally, DLA only considers price in the vendor selection process, but quantification of the costs associated with poor contractor performance could allow consideration of these costs in the bid evaluation process as well.

B. <u>Objective</u>. The objective of this study is to quantify the cost per incident of late contractor delivery.

C. <u>Scope</u>

1. <u>Definition of Poor Performance</u>. The costs of poor performance may be viewed as falling into two categories, costs associated with late contractor delivery and costs associated with poor quality. This effort examines the cost of poor contractor performance as exhibited in delivery timeliness. Furthermore, this effort is limited to the quantification of DLA incurred costs. Costs external to DLA (user costs) may be more substantial, but are far more difficult to obtain and verify. (See Figure 1 for a breakdown of some of the costs of poor performance, where the areas in bold print represent those costs addressed by this analysis.) The quantification of the DLA costs will at least provide a firm lower bound to the costs of poor contractor performance.

2. <u>Direct Versus Indirect Costs</u>. An attempt has been made to distinguish between direct and indirect costs incurred by DLA as a result of late delivery. The direct costs represent the labor and material expended in resolving late deliveries. One of the most evident indirect costs to DLA is the cost of maintaining increased safety levels of materiel required because of increased production lead times (PLT). This analysis quantifies those costs associated both with the direct actions taken to obtain the contracted materiel and the indirect costs resulting from the increased safety levels which result from late deliveries.

3. <u>Test Using One Supply Center</u>. The cost of late contractor delivery for items managed by the Defense General Supply Center (DGSC) was quantified to test the methodology and the feasibility of implementing the results. Costs at the other Supply Centers are probably different because of item population and policy differences.

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Figure 1.   PERFORMANCE COST HIERARCHY
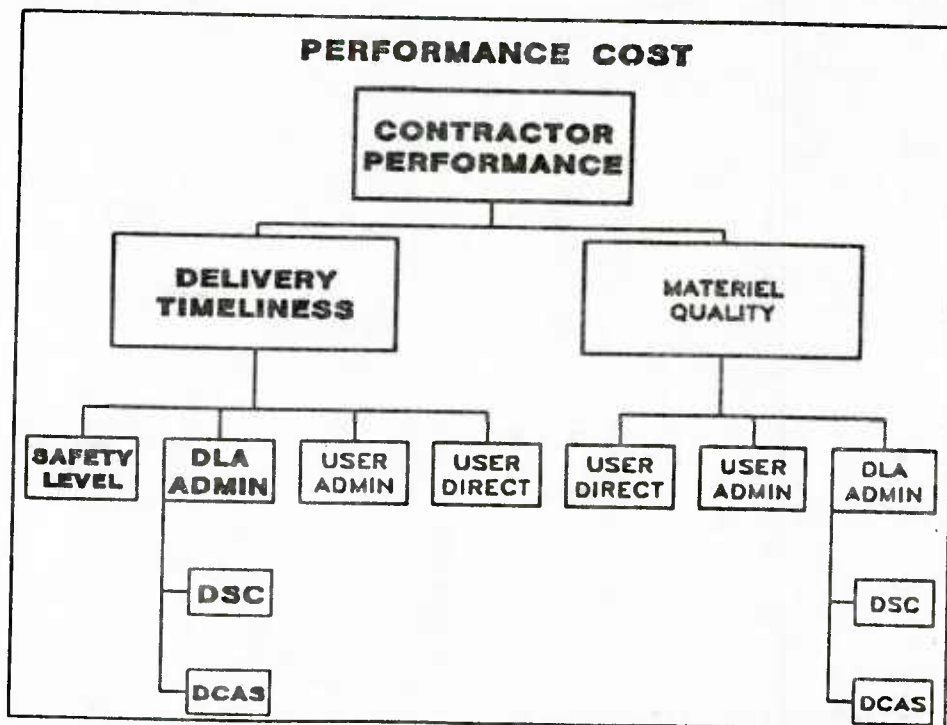
II.   APPROACH. This analysis was divided into two parts. The first part of the analysis involved quantification of the indirect costs associated with late contractor delivery. These costs were identified in the increased safety levels resulting from increased lead times. The second part of the analysis examined the direct costs of late delivery. These direct costs are primarily the expenditure of labor and materials required to bring about delivery of the items.

A. Indirect Cost Methodology. The approach used to develop the indirect costs was to (1) combine items to obtain a representative typical item for each FSC, (2) run a supply performance model to compute safety levels resulting from changing the PLT, and (3) compute a daily lateness cost for each FSC.

B. Direct Cost Methodology. The approach used to develop the direct costs of late delivery was to (1) identify the functions performed by DLA as a result of late contractor delivery, (2) construct a hierarchical description (decision tree) of the possible processing paths in the resolution of an incident of late delivery, (3) develop cost estimates (labor requirements and material costs) for each subtask of the decision tree, (4) develop probabilities for each branch in the decision tree, and (5) compute the expected cost of late delivery from the subtask cost and branch likelihood information.

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III. ANALYSIS

   A. Analysis of Indirect Costs

      1. Item Aggregation

For the purposes of simplification of the analysis, items from the Materiel Readiness Decision Support System (MARS) data files were combined within each FSC to produce a representative "average" item for that FSC. Items were excluded from this aggregation process based on the following criteria:

   o Nonstocked status,

   o Zero demand,

   o Zero unit price,

   o Numeric Stockage Objective (NSO) status.

For those items passing this screening step, averages were computed over each FSC for the following item parameters:

   o Unit Price

   o Stock on Hand Quantity

   o Backorder Quantity

   o Due in Quantity

   o Administrative Lead Time (ALT)

   o Production Lead Time (PLT)

   o Procurement Cycle Period

   o Smoothing Constant (ALPHA)

   o Average Requisition Size

   o Mean Absolute Deviation

   o Prepositioned Mobilization Reserve Materiel Requirement (PMRMR)

   o Quarterly Forecast of Demand (QFD)

   o Quarterly Forecast of New Demand

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o   Annual Demand Quantity

o   Annual Demand Frequency

2. Safety Level Computation. A modified version of the Projected Performance Model (PERMES) from the MARS system was used to compute safety levels using the parameters for the FSC representative items developed in the previous step.   The PERMES model computes standard supply performance measures under varying sets of conditions.   (For further details on the PERMES model see DLA Operations Research and Economic Analysis Office Report, "Materiel Readiness Decision Support System (MARS)," October 1984.) For this study, the default economic order quantity and safety level algorithms from the Standard Automated Materiel Management System (SAMMS) were used.   A set of five runs was made to compute safety levels for cases where delivery ranged from thirty days early to ninety days late.

3. Assumptions for Cost Computations. Assumptions made for the analysis are:

a. The Contract Delivery Date (CDD) is equal to the Award Date plus the Production Lead Time (PLT); therefore, a late delivery necessarily causes an increase in the PLT.

b. The PLT continues to grow and never returns to its original level. (DLA Operations Research and Economic Analysis Office Report, "The Impact of Contracting Initiatives on Lead Time," November 1986 discusses this phenomena.) The current mechanism of setting the CDD based upon PLT may lead to PLT creep.

c. The remaining life of the item is assumed to be five years.   (DOD Parts Control Program Report PCP-86-01, "Cost-Benefit Reporting Technique for Military Parts Control Advisory Groups," dated 7 November 1986 by the Defense Electronics Supply Center, assumes new parts to have an inventory life of ten years. We assume that the typical item has experienced half of its inventory life.)

d. The daily lateness cost was developed using the ninety day late case. The daily cost is relatively insensitive to the amount of time the contract is late from zero to ninety days, and the ninety day late case was chosen to minimize the small amount of variation from the nearly linear relationship between cost and lateness.

e. The average contract cost was calculated using data representing stock replenishment buys for the period October 1982 - May 1985.   Direct deliveries were excluded from consideration in the computation of average contract value because they were assumed not to be representative buys.

4. Safety Level Cost Computation. The results from the PERMES runs were used to compute the change in the safety level cost resulting from the varying delivery circumstances.   Late deliveries can lead to increased safety levels because a late delivery affects an item's

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production lead time (PLT). (The PLT of record is computed by adding one-third of the previous PLT of record to two-thirds of the PLT of the current buy.) The PLT is one of several item parameters used to compute safety levels, and an increase in PLT leads to an increase in the safety level quantity. The cost of holding the increased safety has been added to the investment cost of obtaining the increased safety level to compute the cost of the late delivery. The SAMMS holding cost rate of 18 percent per year was used for computations. The holding cost has been discounted over the remaining life of the materiel in accordance with DLAM 7041.1, "Economic Analysis". The ratio of safety level cost to average contract cost was then computed for each supply class.

5. Indirect Cost Findings

The results of the safety level cost computations are presented in Table 1. In Table 1, the first column, labeled "FSC", represents the Federal Supply Class (FSC); the second column, labeled "SL INVST COST($)", represents the investment cost (per day of lateness) of the increased safety level; the third column, labeled "HOLDING COST ($)", represents the discounted life cycle cost (per day) of holding the increased safety level; the fourth column, labeled "TTL DAY COST ($)", represents the sum of the previous two columns; the fifth column, labeled "AVERAGE CONTRACT", represents the average contract value for stock replenishment buys for that FSC; the sixth column, labeled "DAY COST RATIO (%)", is the percentage of the contract cost represented by the daily total safety level cost; the seventh column, labeled "DGSC RATIO (%)", represents the percentage of the contract value that the safety level cost represents for a typical DGSC late delivery (see the next paragraph for details on "typical" lateness at DGSC); and the last unlabeled column represents the number of contracts used for the computation of average contract value. At the end of the table is a summary for all FSC's weighted by contract frequency.

The daily lateness costs for each FSC due to increased safety levels were observed to range from zero to over five percent of contract cost per day. However, for those FSC's where the number of observations (contracts) is high (above 100), the range is from zero to one percent of the contract cost per day. The average FSC daily lateness cost is 0.125 percent of contract cost. Using available delivery statistics, the cost of a typical late delivery can be derived. A study by the DLA Operations Research and Economic Analysis Office ("Impact of Competition on Contract Delinquencies," May 1987) found that 31 percent of DGSC purchases were delivered late (that is, after the contract delivery date (CDD)). This study also found that these late deliveries were 49 days late on the average. Using these figures together with the computed daily safety level lateness cost yields $314 as the cost of an average DGSC late contract in increased safety levels. This cost for the average DGSC late delivery is 6.1 percent of the average replenishment contract cost. On an FSC basis, the safety level cost for typical DGSC late deliveries ranged from zero to over two hundred percent of contract cost (zero to fifty percent for FSC's with many contracts). Table 2 shows the distribution of computed FSC safety level lateness costs as a percentage of contract cost for a typical DGSC late delivery.

Table 1

SAFETY LEVEL COSTS

FSC	SL INVST COST ($)	HOLDING COST ($)	TTL DAY COST ($)	AVERAGE CONTRACT	DAY COST RATIO(%)	DGSC RATIO(%)	
1040	0.23	0.16	0.38	899.94	0.041692	3.043857	3
1055	7.33	5.25	12.58	2538.58	0.495582	34.383506	42
1075	1.15	0.85	2.04	0.00	0.000000	0.000000	0
1080	4.18	3.99	7.17	0.00	0.000000	0.000000	0
1090	4.70	3.37	8.07	0.00	0.000000	0.000000	0
2050	0.00	0.00	0.00	0.00	0.000000	0.000000	0
2090	0.00	0.00	0.00	0.00	0.000000	0.000000	0
2510	35.50	25.41	60.91	0.00	0.000000	0.000000	0
3210	0.00	0.00	0.00	3378.55	0.217962	10.680127	33
3220	4.29	3.07	7.36				
3230	3.63	2.60	6.22	797.12	0.780713	38.354644	176
3405	5.40	3.87	9.37	1619.21	0.573389	28.047056	21
3410	3.06	3.15	5.35	0.00	0.000000	0.000000	0
3413	0.00	0.00	0.00	5639.18	0.398262	15.514816	63
3415	13.09	9.37	32.46	1778.10	0.000000	0.000000	10
3416	0.00	0.00	0.00	1585.23	0.313812	15.376785	13
3417	3.90	3.08	4.97	5997.96	0.101535	4.575210	21
3419	3.55	2.54	6.09	147.85	2.125805	104.360413	3
3424	1.83	1.31	3.14	5920.83	0.000000	0.000000	22
3426	0.00	0.00	0.00	1790.01	0.000000	0.000000	332
3431	0.00	0.00	0.00	2309.97	0.000000	0.000000	16
3432	4.95	3.55	8.50	1648.41	0.515712	25.269867	321
3433	3.16	2.28	5.45	518.00	0.594021	25.107025	1
3436	1.48	1.06	2.53	14899.53	0.017352	0.850268	7
3438	0.00	0.00	0.00	3089.45	0.000000	0.000000	1955
3439	4.79	3.42	6.32	5026.95	0.163625	8.017645	57
3441	0.00	0.00	0.00	115.88	0.000000	0.000000	1
3442	0.34	0.17	0.42	2072.00	0.020216	0.990683	1
3443	10.07	7.21	17.27	6894.52	0.357994	12.641694	22
3444	0.00	0.00	0.00	2989.62	0.000000	0.000000	16
3445	0.00	0.00	0.00	1656.90	0.000000	0.000000	2
3448	0.63	0.59	1.42	255.00	0.855871	27.237656	1
3449	0.00	0.00	0.00	18345.25	0.000000	0.000000	4
3460	6.96	4.98	11.94	7381.10	0.163925	6.032307	11
3455	6.57	4.71	11.38	1710.89	0.655225	32.302002	1964
3456	1.62	1.16	2.75	645.89	0.327864	16.065336	104
3460	0.00	0.00	0.00	1640.21	0.000000	0.000000	729
3465	2.65	1.90	4.55	1295.46	0.351383	17.317683	65
3510	6.09	4.36	10.48	1532.34	0.682489	33.441956	391
3520	1.58	1.13	2.71	7105.00	0.038131	1.668406	2
3530	3.80	3.01	4.61	3842.37	0.125133	6.131510	151
3610	5.99	4.38	10.27	3238.85	0.317131	15.539400	265
3611	6.71	4.80	11.51	1388.14	0.630289	40.684174	32
3615	0.00	0.00	0.00	6502.40	0.000000	0.000000	36
3625	0.10	0.07	0.17	0.00	0.000000	0.000000	0
3630	10.53	7.54	18.07	0.00	0.000000	0.000000	0
3635	1.91	1.37	3.28	0.00	0.000000	0.000000	0
3650	0.56	0.40	0.96	0.00	0.000000	0.000000	436
3655	7.10	5.08	12.18	5916.06	0.205812	10.084764	

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Table 1 (Continued)

FSC	SL INVST COST ($)	HOLDING COST ($)	TTL DAY COST ($)	AVERAGE CONTRACT	DAY COST RATIO(%)	DGSC RATIO(%)	
3660	3.25	2.33	5.58	1383.06	0.403169	19.755264	3
3670	6.35	4.55	10.90	0.00	0.000000	0.000000	0
3680	0.00	0.00	0.00	0.00	0.000000	0.000000	0
3694	0.00	0.00	0.00	9846.87	0.000000	0.000000	9
3695	2.78	1.98	4.74	13846.23	0.034227	1.677128	37
3920	0.00	0.00	0.00	12158.00	0.000000	0.000000	135
3990	0.00	0.00	0.00	59930.10	0.000000	0.000000	199
4110	0.00	0.00	0.00	24813.05	0.000000	0.000000	348
4120	0.00	0.00	0.00	9475.80	0.000000	0.000000	62
4130	9.47	6.78	16.25	3021.41	0.537850	26.354645	3233
4140	7.54	5.40	12.93	5854.70	0.220914	10.624798	1893
4230	0.00	0.00	0.00	8191.90	0.000000	0.000000	35
4240	0.00	0.00	0.00	8646.50	0.000000	0.000000	711
4920	5.94	4.25	10.20	5977.39	0.170563	6.357589	2193
4933	9.88	7.06	16.92	4513.90	0.374754	16.362915	58
9220	9.01	3.58	8.59	2812.95	0.305345	14.961919	41
9940	0.00	0.00	0.00	1520.83	0.000000	0.000000	9708
5970	7.94	5.69	13.63	1366.79	0.997058	48.855850	4169
9975	0.00	0.00	0.00	2130.40	0.000000	0.000000	5146
5977	4.76	3.41	8.17	2672.04	0.305728	14.980663	1993
5995	0.00	0.00	0.00	4522.99	0.000000	0.000000	6124
6105	6.74	4.82	11.56	6573.91	0.175822	6.615296	3932
6110	5.28	3.78	9.06	8861.68	0.102217	5.008646	1745
6115	5.95	4.26	10.21	8836.16	0.115579	5.663383	661
6120	6.64	4.76	11.40	9647.61	0.116170	5.780313	357
6125	7.63	5.46	13.09	12766.30	0.102532	5.024083	137
6130	6.09	4.36	10.45	5087.55	0.205497	10.069330	1679
6135	0.00	0.00	0.00	7601.05	0.000000	0.000000	133
6140	0.00	0.00	0.00	9340.26	0.000000	0.000000	984
6150	0.00	0.00	0.00	3419.43	0.000000	0.000000	1651
6210	5.15	3.68	8.83	1964.07	0.473672	23.209900	6974
6220	6.50	4.65	11.15	3091.45	0.360524	17.665649	2310
6230	0.00	0.00	0.00	9383.90	0.000000	0.000000	752
6240	0.00	0.00	0.00	5089.16	0.000000	0.000000	1890
6250	0.00	0.00	0.00	2130.63	0.000000	0.000000	659
6260	0.00	0.00	0.00	24967.67	0.000000	0.000000	101
6320	0.00	0.00	0.00	4094.47	0.000000	0.000000	42
6340	0.00	0.00	0.00	6119.65	0.000000	0.000000	292
6350	0.00	0.00	0.00	4875.70	0.000000	0.000000	994
6605	5.05	3.61	8.66	5782.24	0.146766	7.336529	237
6610	4.38	3.14	7.52	6456.90	0.116398	8.703515	417
6615	0.00	0.00	0.00	7359.86	0.000000	0.000000	317
6620	6.83	4.88	11.71	9030.14	0.129712	6.355910	931
6635	0.00	0.00	0.00	5309.43	0.000000	0.000000	464
6645	5.43	3.90	9.33	3649.68	0.255507	12.519628	741
6650	6.19	4.43	10.63	3291.09	0.322664	15.620327	66
6655	17.78	12.73	30.51	5621.20	0.515297	25.249527	39
6660	0.00	0.00	0.00	5004.37	0.000000	0.000000	352
6665	9.46	5.79	16.26	10256.71	0.158766	7.780633	113
6670	0.00	0.00	0.00	4636.73	0.000000	0.000000	161

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Table 1 (Continued)

FSC	SL INVST COST ($)	HOLDING COST ($)	TTL DAY COST ($)	AVERAGE CONTRACT	DAY COST RATIO(%)	DGSC RATIO(%)	
			14.26	3172.21	0.450157	22.057709	601
6675	8.22	5.96	10.58	4306.22	0.245749	12.041666	2925
6680	6.17	4.42	12.33	3714.72	0.231884	16.262299	6256
6685	7.19	5.14	6.68	4588.81	0.146562	7.132549	348
6695	2.69	2.79	7.11	12942.81	0.054919	2.691009	72
6710	4.14	2.97	8.79	11591.46	0.075810	3.714679	226
6720	5.12	3.67	9.46	9161.00	0.103256	5.059555	239
6730	5.51	2.95	10.42	2202.56	0.472660	22.170135	494
6740	6.07	4.35	0.00	9421.29	0.000000	0.000000	1818
6750	0.00	0.00	0.00	7701.20	0.000000	0.000000	522
6760	0.00	0.00	4.83	5766.94	0.083779	4.105187	8
6770	2.82	2.02	9.18	6156.38	0.112554	5.515141	26
6780	6.25	3.83	0.00	12656.41	0.000000	0.000000	810
6810	0.00	0.00	104.03	2249.10	4.625443	226.646682	6
6820	60.63	43.40	0.00	11526.89	0.000000	0.000000	160
6830	0.00	0.00	0.00	26237.29	0.000000	0.000000	135
6840	0.00	0.00	0.00	20618.82	0.000000	0.000000	1241
6850	0.00	0.00	5.33	9226.70	0.057724	2.828473	7
6910	3.10	2.22	0.00	13325.48	0.000000	0.000000	249
6920	0.00	0.00	13.13	2669.81	0.481802	24.098312	211
6930	7.85	5.48	0.00	4496.03	0.000000	0.000000	25
6940	0.00	0.00	0.00	6524.27	0.000000	0.000000	1422
7210	0.00	0.00	0.00	11562.50	0.000000	0.000000	752
7320	0.00	0.00	21.39	4810.88	0.444704	21.790482	99
7360	12.47	8.92	0.00	85.60	0.000000	0.000000	1
7450	0.00	0.00	6.26	896.04	0.698802	34.241302	43
7610	3.85	2.81	6.10	401.85	2.014696	98.720106	6
7640	4.72	3.38	6.96	717.74	0.972114	47.633376	701
7690	4.07	2.81	0.00	31881.50	0.000000	0.000000	127
8110	0.00	0.00	0.00	26547.37	0.000000	0.000000	125
8120	0.00	0.00	10.72	1021.75	1.048914	51.396774	66
8125	6.25	4.47	0.00	11222.91	0.000000	0.000000	8
8130	0.00	0.00	12.25	4006.36	0.305966	14.992346	18
8140	7.14	5.11	0.00	483.25	0.000000	0.000000	2
8145	0.00	0.00	0.00	29047.83	0.000000	0.000000	1031
8150	0.00	0.00	0.00	10710.80	0.000000	0.000000	51
8160	0.00	0.00	10.36	1562.22	0.663060	32.489441	513
8220	8.04	4.32	0.00	5740.25	0.000000	0.000000	789
8330	0.00	0.00	7.07	2691.12	0.262714	12.872878	268
8340	4.12	2.95	0.00	10739.71	0.000000	0.000000	57
9250	0.00	0.00	12.26	2001.33	0.612641	30.029190	730
9390	7.15	5.12	32.26	3918.99	0.667922	27.828171	62
9925	12.87	8.29	0.00	11034.82	0.000000	0.000000	12
9930	0.00	0.00					

OVERALL RESULTS WEIGHTED BY CONTRACT FREQ

TTL DAY COST ($)	AVERAGE CONTRACT	DAY COST RATIO (%)	DGSC RATIO (%)
6.41	8106.83	0.12541	6.14522

Table 2

DISTRIBUTION OF SAFETY LEVEL LATENESS COSTS

DGSC SL Cost Ratio (%)	Number of FSC's	Percent of Total
0	79	55.6
0 - 5	10	7.0
5 - 10	14	9.9
10 - 15	10	7.0
15 - 20	9	6.3
20 - 25	5	3.5
25 - 30	6	4.2
30 - 35	3	2.1
35 - 40	1	0.7
40 - 45	1	0.7
45 - 50	1	0.7
over 50	3	2.1

B. Analysis of Direct Costs

1. Identification of Supply Center Required Functions. Defense Supply Center (DSC) actions required as a result of late contractor delivery include:

a. F-38 Report Production - The F-38 report is generated each month to identify contractors with contract lines at least thirty days late.

b. F-38 Report Processing - The process of reviewing the F-38 report, mailing it to the contractor, and processing it following the contractor's response is directly attributable to late delivery.

c. Delivery Assurance - Status requests must be satisfied occasionally for delinquent items.

d. Delinquent Contract Reconciliation with DCAS - This function is required to ensure that a contract is indeed delinquent through the validation of Supply Center records with DCAS records.

e. Delayed Delivery Report Processing - The delay in delivery reports generated by DCAS must be responded to.

f. Management of Backorders - Some late deliveries result in backorders which may require intensive management.

g. Reprocurement of Cancelled Contracts - Some delinquencies will lead to cancellation and therefore reprocurement of the assets. If the reprocurement cost is not received as consideration from the contractor, then it is attributable to the late delivery.

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2. <u>Identification of DCAS Required Functions</u>. The Defense Contract Administration Services (DCAS) actions required as a result of late delivery are limited to:

a. Reporting Delayed Deliveries - Any contract which is expected to be late by a specified length of time (usually thirty days) must be reported.

b. Increased Surveillance - Late delivery may result in increased monitoring of the contract.

3. <u>Late Delivery Cost Computation Methodology</u>.

The expected cost of late contractor delivery is computed by first computing the expected cost of each branch of the decision tree and then summing these costs. For example, consider the decision tree in Figure 2.

Figure 2. SAMPLE DECISION TREE
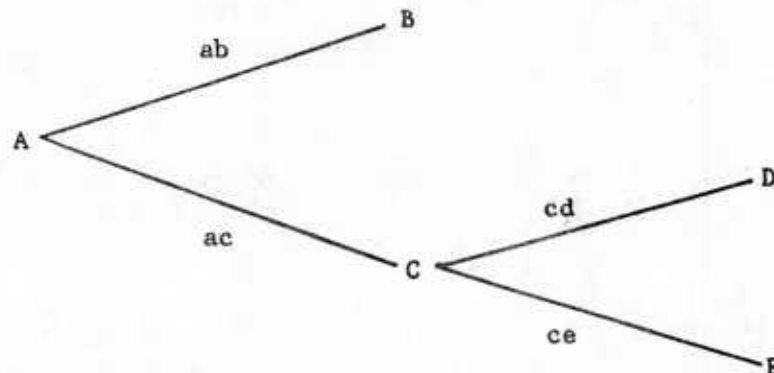
There are five nodes denoted <u>A</u>, <u>B</u>, <u>C</u>, <u>D</u> and <u>E</u>. Nodes <u>B</u> and <u>C</u> represent subtasks under node <u>A</u>, while nodes <u>D</u> and <u>E</u> represent subtasks under node <u>C</u>. There are four path probabilities denoted <u>ab</u>, <u>ac</u>, <u>cd</u> and <u>ce</u>. The path probability <u>ab</u> represents the probability of subtask <u>B</u> occurring under node <u>A</u>. With each subtask at the lowest level there is a cost associated with performing the subtask. Therefore the expected cost at node <u>A</u> in this instance can be computed using the formula:

$$(ab * B) + (ac * ((cd * D) + (ce * E)))$$

The costs for late delivery are computed in the same manner using the decision tree representing the tasks performed as a result of late vendor delivery.

4. <u>Decision Tree</u>. The decision tree constructed for late delivery cost evaluation is shown in Figure 3. This decision tree describes the tasks performed as a result of late delivery. At the Supply

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Figure 3. DIRECT COST DECISION TREE
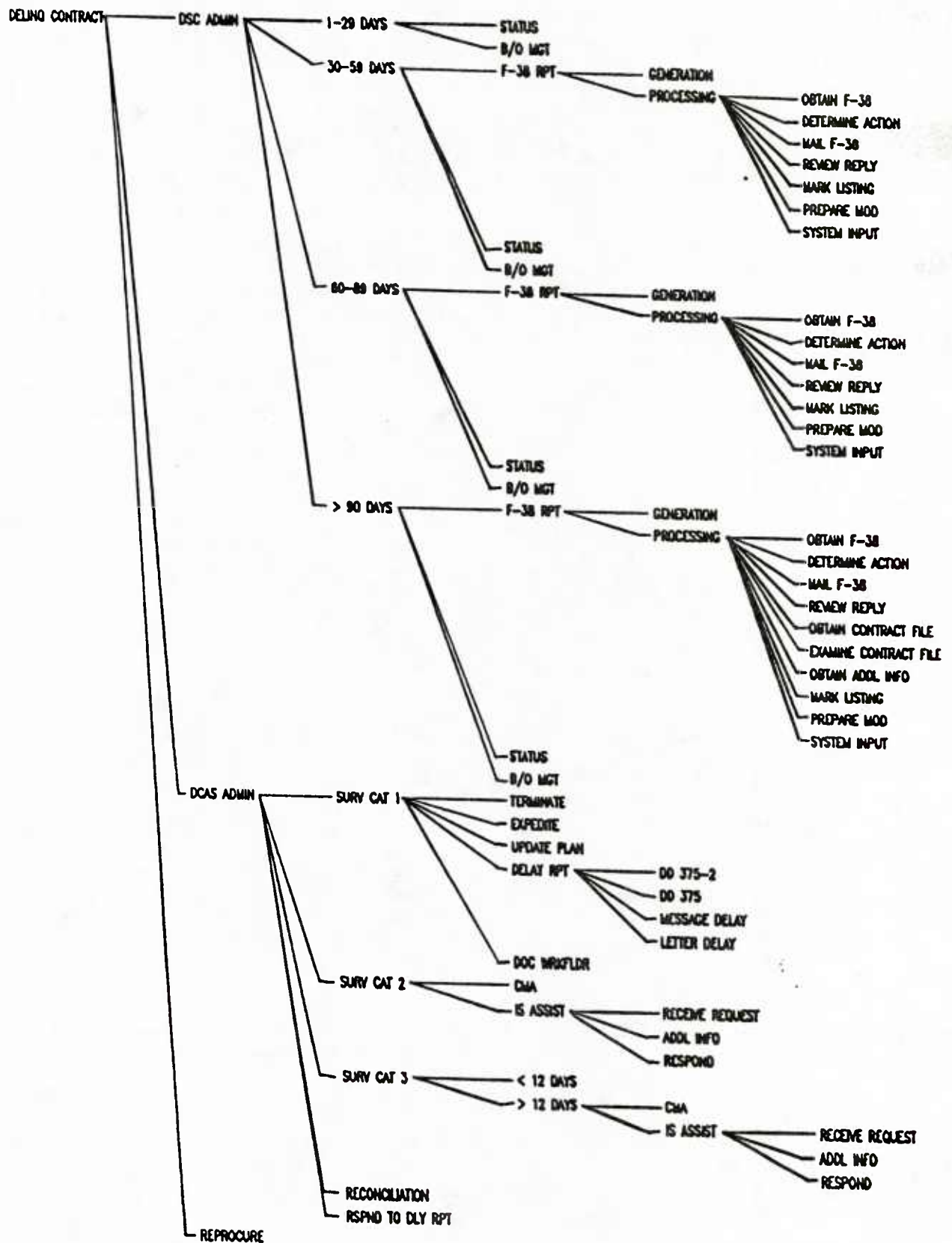
Center, little effort is expended working a late contract until it becomes thirty days late. This provides contractors with a thirty day grace period. DCAS corrective action generally begins when the contract is twelve days late (for Surveillance Category 3 items). It should be noted that responsibility for administration of large purchases is predominantly given to DCAS (Supply Centers manage few, if any, large purchase contracts), while small purchases are almost exclusively administered by the purchasing Supply Center.

5. <u>Subtask Cost Estimates</u>. The cost estimates for the decision tree nodes are shown in Table 3. These cost estimates include direct labor expended on the tasks, a fatigue allowance for the labor, leave and fringe benefits, and material costs such as the cost of phone calls or postage where quantified. The sources of this information included appropriate work standards and data from management reports, as well as best guesses from functional experts. Additionally, the following grade levels were assumed for the functions represented in the decision tree: post award supply center personnel - GS-11/5, supply operations personnel - GS-11/5, industrial specialists - GS-11/5, contract management assistants - GS-5/5. Further details on the cost estimates can be found in Appendix A.

6. <u>Branch Probabilities</u>. The weighted branch probabilities for the decision tree are also shown in Table 3. As with the subtask cost estimates, the decision tree branch probabilities were obtained from work standards, management reports and best estimates. These weighted probabilities actually represent the frequency which a specified task is performed. Therefore, values greater than one may occur. We will still refer to these values as probabilities, however. Further details can be found in Appendix A.

7. <u>Direct Cost Findings</u>. Using the hierarchical approach to describe the functions performed by DLA as a result of late delivery, the average cost per incident of late delivery was computed to be $11.06 or 0.21 percent of average replenishment contract costs (see Table 3). Much of the data used to compute this value was based on estimates, so the actual cost is difficult to identify accurately. The average cost is sensitive to several of the input data elements, but not so sensitive to be significant when compared to the indirect costs. The direct cost is small primarily because DLA does relatively little to correct the situation. That effort which is expended in resolving late deliveries is used primarily on contracts which have been delinquent for quite some time (over ninety days).

C. <u>Examples of Usage of Results</u>. This section explains two possible methods for applying the costs of late delivery developed in this study.

1. <u>Bid Evaluation</u>. The costs of late delivery can be applied to the bid evaluation process. The daily lateness costs can be used to provide a premium to contractors demonstrating a better than average delivery history, while assessing a penalty to contractors performing worse than the average. The average delivery history represents the typical cost and provides a reference point against which actual performance can be

Table 3

DIRECT COST SPREADSHEET

MODE	PROG	PROG EFFORT	MODE	PROG	PROG EFFORT	MODE	PROG	PROG EFFORT	MATERIAL	LABOR COST	MAT COST	TOTALS
DSC	0.770											
			1-29 DAYS	0.440		STATUS B/O MGT	0.020 0.010	0.5762 0.5722	F-38 REPORT 1.000	PROCESSING 1.000	OBTAIN F-38	1.000 0.0017	$2.500	$0.000	$0.004	
			30-59 DAYS	0.220							DET ACTION	1.000 0.0029		$0.031	$0.000	
						STATUS B/O MGT	0.040 0.025	0.5762 0.5722	F-38 REPORT 1.000	GENERATION 1.000 PROCESSING 1.000	MAIL F-38	1.000 0.0042	$0.240	$0.017	$0.000	
			60-89 DAYS	0.110							REV REPLY	1.000 0.0042		$0.010	$0.000	
						STATUS B/O MGT	0.090 0.050	0.5762 0.5722	F-38 REPORT 1.000	GENERATION 2.000 0.0000 PROCESSING 1.000	MARK LSTNG	1.000 0.0011		$0.053	$0.000	
			OVER 90 DAYS	0.230							PREP MOD	0.153 0.0670		$0.040	$0.000	
						STATUS B/O MGT	0.120 0.100	0.5762 0.5722	F-38 REPORT 1.000	GENERATION 3.000 0.0000 PROCESSING 1.000	SYS INPUT	1.000 0.075	$2.500	$0.134	$0.022	

Table 3 (Continued).

NODE	PROG	NODE	PROG	NODE	PROG	EFFORT	NODE	PROG	EFFORT	MATERIAL	LABOR COST	MAT COST	TOTALS
SCAS 0.250	SC 1 0.026	TERMINATE	0.010	2.5000							$0.017	$0.000	
		EXPEDITE	0.044	1.0736							$0.004	$0.000	
		UPDT PLAN	0.288	0.5455							$0.112	$0.000	
		DELAY RPT	1.000								$0.000	$0.000	
					DO 375-2	0.253	0.4862			$0.020	$0.085	$0.000	
					DO 375	0.345	1.0484			$0.020	$0.249	$0.000	
					RSG DELAY	0.126	0.5761			$0.020	$0.050	$0.000	
					LTR DELAY	0.060	0.4465			$0.240	$0.042	$0.000	
	SC 2 0.110	RECYCLDR	2.000	0.0307									
		CNA	1.500	0.1880	RECV RQST	1.000	0.1172				$0.449	$0.000	
		IS ASSIST	0.750		ADDL INFO	1.000	0.1710				$0.256	$0.000	
					RESPOND	1.000	0.2609			$0.250	$0.373	$0.021	
	SC 3 0.864	CNA	1.000	0.1880	RECV RQST	1.000	0.1172				$0.800	$0.000	
		IS ASSIST	0.500		ADDL INFO	1.000	0.1710				$0.526	$0.000	
					RESPOND	1.000	0.2609			$0.250	$0.607	$0.142	
		< 12 DAYS	0.000	0.0000							$2.928	$0.000	
		> 12 DAYS	1.500								$4.447	$0.000	$15.371
RECONCILIAT 1.000			1.000	0.0800							$3.534	$0.000	
			1.000	0.0800							$2.114	$0.000	$4.342
PLT RPT REP 1.000			1.000	0.1600							$123.000	$0.000	$123.000
REPRICHE 0.011										$123	$123.000	$0.000	$11.654

measured. For example, suppose contractor A has a performance record of 95 percent on-time deliveries, contractor B has a performance record of 69 percent on-time deliveries and contractor C has a performance record of 50 percent on-time deliveries. Furthermore, suppose that contractor A's late deliveries are on the average 15 days late, contractor B's are 50 days late and contractor C's are 40 days late. The FSC for which they are bidding has a daily lateness safety level cost ratio of 0.12 percent. The premiums/penalties assessed in this bid evaluation would be calculated as follows:

To compute the expected costs due to late delivery use the formula

$$
\begin{array}{ccc}
\text{EXPECTED} & & \text{CONTRACTOR} & \text{DIRECT} & \text{AVERAGE} & \text{DAILY} \\
\text{COST} & = & \text{DELINQUENCY} \quad * & \text{COST} \quad + \quad \text{DAYS} \quad * \quad \text{COST} \\
\text{RATIO} & & \text{RATE} & \text{RATIO} \quad \text{LATE} \quad \text{RATIO}
\end{array}
$$

The expected cost of lateness for any purchase (using the average DGSC values) would then be

$$
\text{AVERAGE}: \quad 0.31 * (0.21 + 49 * 0.12) = 1.89 \text{\%}
$$

And the corresponding expected costs for each of the three contractor's in this example and their differences from the average are computed as

$$
\text{A}: \quad 0.05 * (0.21 + 15 * 0.12) = 0.10 \quad - \quad 1.89 = 1.79 \text{ \% premium}
$$

$$
\text{B}: \quad 0.31 * (0.21 + 50 * 0.12) = 1.93 \quad - \quad 1.89 = 0.04 \text{ \% penalty}
$$

$$
\text{C}: \quad 0.50 * (0.21 + 40 * 0.12) = 2.51 \quad - \quad 1.89 = 0.62 \text{ \% penalty}
$$

Therefore, contractor A's bid would be accepted over contractor C's bid if it is up to 2.41 percent greater, since the overall expected costs to DLA (on the basis of past delivery performance) would be less. The application of this approach requires having valid historical data on contractor performance which accurately identifies the delinquency as either contractor or government caused. Lack of an adequate contractor performance history database could lead to erroneous assignment of evaluation factors.

2. Liquidated Damages. An alternative method to applying the late delivery costs incurred by DLA is in the assessment of liquidated damages. This approach would entail obtaining damages from the contractor based on the cost to DLA of the late delivery. As an example, assume that a contractor delivers late on a particular contract by 75 days. Furthermore, assume that the FSC for the item has a daily lateness cost percentage of 0.12 percent and the direct cost of lateness is 0.21 percent. The cost of the late delivery can be computed as follows:

$$
\begin{array}{ccc}
\text{CONTRACT} & & \text{DIRECT} & \text{NUMBER} & \text{DAILY} & \text{TOTAL} \\
\text{LATENESS} & = & \text{COST} \quad + & \text{DAYS} \quad * \quad \text{COST} \quad * & \text{CONTRACT} \\
\text{COST} & & \text{RATIO} & \text{LATE} & \text{RATIO} & \text{COST}
\end{array}
$$

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Therefore, if the contract had a total value of $5000, the lateness cost would be computed

COST: (0.21 percent + 75 days * 0.12 %/day) * $5000 = $ 461

The liquidated damages could be assessed as $461, or 9.21 percent of the contract cost.

IV. CONCLUSIONS

A. Cost of Late Delivery. A typical late delivery to the Defense General Supply Center leads to roughly $314 in indirect costs and $11 in direct costs. These costs represent about six percent of the contract cost. The indirect costs vary considerably by item (from zero to fifty percent of the contract value for items with many buys), and are significant in those cases where a late delivery leads to a substantial change in the safety level which is maintained for the item. The direct costs are relatively insignificant because little effort is expended to correct late deliveries. There is little to deter a vendor from delivering past the contracted delivery date. (The standard thirty day grace period may even encourage late deliveries.)

B. Use of Late Delivery Cost

1. Application in Bid Evaluation Process. It is viable to use contractor performance history in evaluating bids, provided that an adequate performance history is available. One approach to apply contractor performance to the evaluation of bids has been demonstrated in this report; others are available as well. A significant limitation of this approach is the requirement for an accurate contractor performance history database. The present database is of questionable validity and could lead to the unjustified awarding of premiums or penalties.

2. Assessment of Liquidated Damages. Another way which the late delivery cost estimates developed in this analysis could be applied is in the assessment of liquidated damages in the event of late vendor delivery. Both the indirect and direct cost could be recovered as damages. This approach would avoid the potential problem of having inadequate contractor performance history data. The actual performance on any given contract would be used to compute the damages rather than the anticipated performance. Consistent collection of significant damages might provide a real incentive for contractors to meet the contract delivery date.

V. RECOMMENDATIONS. We recommend that the cost of late delivery developed in this study be utilized in a test application at DGSC using one or both of the approaches described above. This test would determine if the costs of late delivery could be used effectively in the contracting and production management areas to reduce costs incurred by DLA as a result of poor contractor performance. If successful, similar factors should be developed for the other hardware centers for their use.

APPENDIX A

BACKGROUND INFORMATION FOR

THE DIRECT COST DECISION TREE

APPENDIX A - DIRECT COST DECISION TREE DATA BACKGROUND

1. DSC ADMINISTERED -

    Weighted Probability = 0.770
    Source: DGSC-PRN IOM dated 24 Jun 87, SUBJECT: Response to Data
             Request Dated 28 Apr 87

    1.1. 1-29 DAYS -

        Weighted Probability = 0.440
        Source: DGSC-PRN IOM dated 24 Jun 87, SUBJECT: Response to Data
                 Request Dated 28 Apr 87

        1.1.1. STATUS -

            Weighted Probability = 0.020
            Source: Estimate

            Effort = 0.5762
            Source: DIMES Standard 1510

            Material Cost = $ 2.50
            Source: Estimate

        1.1.2. BACKORDER MANAGEMENT -

            Weighted Probability = 0.010
            Source: Estimate

            Effort = 0.5722
            Source: DIMES Standard 2102

    1.2. 30-59 DAYS -

        Weighted Probability = 0.220
        Source: DGSC-PRN IOM dated 24 Jun 87, SUBJECT: Response to Data
                 Request Dated 28 Apr 87

        1.2.1. F-38 REPORT -

            Weighted Probability = 1.000
            Source: Estimate

            1.2.1.1. GENERATION -

                Weighted Probability = 1.000
                Source: Estimate from conversation with DGSC-PRN

A-2

Material Cost = $ 0.02
Source: Estimate

1.2.1.2. **PROCESSING** -

Weighted Probability = 1.000
Source: Estimate

1.2.1.2.1. **OBTAIN F-38** -

Weighted Probability = 1.000
Source: DIMES Standard 1550

Effort = 0.0017
Source: DIMES Standard 1550

1.2.1.2.2. **DETERMINE ACTION** -

Weighted Probability = 1.000
Source: DIMES Standard 1550

Effort = 0.0029
Source: DIMES Standard 1550

1.2.1.2.3. **MAIL F-38** -

Weighted Probability = 1.000
Source: DIMES Standard 1550

Effort = 0.0062
Source: DIMES Standard 1550

Material Cost = $ 0.24
Source: Estimate

1.2.1.2.4. **REVIEW REPLY** -

Weighted Probability = 1.000
Source: DIMES Standard 1550

Effort = 0.0062
Source: DIMES Standard 1550

1.2.1.2.5. **MARK LISTING** -

Weighted Probability = 1.000
Source: DIMES Standard 1550

Effort = 0.0011
Source: DIMES Standard 1550

1.2.1.2.6. **PREPARE MODIFICATION -**

Weighted Probability = 0.153
Source: DIMES Standard 1550

Effort = 0.0670
Source: DIMES Standard 1550

1.2.1.2.7. **SYSTEM INPUT -**

Weighted Probability = 1.000
Source: DIMES Standard 1550

Effort = 0.0675
Source: DIMES Standard 1550

1.2.2. **STATUS -**

Weighted Probability = 0.040
Source: Estimate

Effort = 0.5762
Source: DIMES Standard 1510

Material Cost = $2.50
Source: Estimate

1.2.3. **BACKORDER MANAGEMENT -**

Weighted Probability = 0.025
Source: Estimate

Effort = 0.5722
Source: DIMES Standard 2102

1.3. **60-89 DAYS -**

Weighted Probability = 0.110
Source: DGSC-PRN IOM dated 24 Jun 87, SUBJECT: Response to Data
        Request Dated 28 Apr 87

1.3.1. **F-38 REPORT -**

Weighted Probability = 1.000
Source: Estimate

1.3.1.1. **GENERATION** -

Weighted Probability = 2.000
Source: Estimate from conversation with DGSC-PRN

Material Cost = $ 0.02
Source: Estimate

1.3.1.2. **PROCESSING** -

Weighted Probability = 2.000
Source: Estimate

1.3.1.2.1. **OBTAIN F-38** -

Weighted Probability = 2.000
Source: DIMES Standard 1550

Effort = 0.0017
Source: DIMES Standard 1550

1.3.1.2.2. **DETERMINE ACTION** -

Weighted Probability = 2.000
Source: DIMES Standard 1550

Effort = 0.0029
Source: DIMES Standard 1550

1.3.1.2.3. **MAIL F-38** -

Weighted Probability = 2.000
Source: DIMES Standard 1550

Effort = 0.0062
Source: DIMES Standard 1550

Material Cost = $ 0.24
Source: Estimate

1.3.1.2.4. **REVIEW REPLY** -

Weighted Probability = 2.000
Source: DIMES Standard 1550

Effort = 0.0062
Source: DIMES Standard 1550

A-5

1.3.1.2.5. **MARK LISTING** -

Weighted Probability = 2.000
Source: DIMES Standard 1550

Effort = 0.0011
Source: DIMES Standard 1550

1.3.1.2.6. **PREPARE MODIFICATION** -

Weighted Probability = 0.306
Source: DIMES Standard 1550

Effort = 0.0670
Source: DIMES Standard 1550

1.3.1.2.7. **SYSTEM INPUT** -

Weighted Probability = 2.000
Source: DIMES Standard 1550

Effort = 0.0675
Source: DIMES Standard 1550

1.3.2. **STATUS** -

Weighted Probability = 0.090
Source: Estimate

Effort = 0.5762
Source: DIMES Standard 1510

Material Cost = $ 2.50
Source: Estimate

1.3.3. **BACKORDER MANAGEMENT** -

Weighted Probability = 0.050
Source: Estimate

Effort = 0.5722
Source: DIMES Standard 2102

1.4. **OVER 90 DAYS** -

Weighted Probability = 0.230
Source: DGSC-PRN IOM dated 24 Jun 87, SUBJECT: Response to Data
          Request Dated 28 Apr 87

1.4.1.   **F-38 REPORT** -

Weighted Probability = 1.000
Source: Estimate

1.4.1.1.   **GENERATION** -

Weighted Probability = 3.000
Source: Estimate from conversation with DGSC-PRN

Material Cost = $ 0.02
Source: Estimate

1.4.1.2.   **PROCESSING** -

Weighted Probability = 3.000
Source: Estimate

1.4.1.2.1.   **OBTAIN F-38** -

Weighted Probability = 3.000
Source: DIMES Standard 1550

Effort = 0.0017
Source: DIMES Standard 1550

1.4.1.2.2.   **DETERMINE ACTION** -

Weighted Probability = 3.000
Source: DIMES Standard 1550

Effort = 0.0029
Source: DIMES Standard 1550

1.4.1.2.3.   **MAIL F-38** -

Weighted Probability = 3.000
Source: DIMES Standard 1550

Effort = 0.0062
Source: DIMES Standard 1550

Material Cost = $ 0.24
Source: Estimate

1.4.1.2.4.   **REVIEW REPLY** -

Weighted Probability = 3.000
Source: DIMES Standard 1550

Effort = 0.0062
Source: DIMES Standard 1550

1.4.1.2.5. **OBTAIN CONTRACT FILE** -

Weighted Probability = 1.000
Source: DIMES Standard 1550

Effort = 0.0287
Source: DIMES Standard 1550

1.4.1.2.6. **EXAMINE CONTRACT FILE** -

Weighted Probability = 1.000
Source: DIMES Standard 1550

Effort = 0.0290
Source: DIMES Standard 1550

1.4.1.2.7. **OBTAIN ADDITIONAL DATA** -

Weighted Probability = 1.000
Source: DIMES Standard 1550

Effort = 0.0355
Source: DIMES Standard 1550

Material Cost = $ 2.50
Source: Estimate

1.4.1.2.8. **MARK LISTING** -

Weighted Probability = 3.000
Source: DIMES Standard 1550

Effort = 0.0011
Source: DIMES Standard 1550

1.4.1.2.9. **PREPARE MODIFICATION** -

Weighted Probability = 0.459
Source: DIMES Standard 1550

Effort = 0.0670
Source: DIMES Standard 1550

1.4.1.2.10. **SYSTEM INPUT** -

Weighted Probability = 3.000
Source: DIMES Standard 1550

Effort = 0.0675
Source: DIMES Standard 1550

1.4.2. **STATUS** -

Weighted Probability = 0.120
Source: Estimate

Effort = 0.5762
Source: DIMES Standard 1510

Material Cost = $ 2.50
Source: Estimate

1.4.3. **BACKORDER MANAGEMENT** -

Weighted Probability = 0.100
Source: Estimate

Effort = 0.5722
Source: DIMES Standard 2102

2. **DCAS ADMINISTERED** -

Weighted Probability = 0.230
Source: DGSC-PRN IOM dated 24 Jun 87, SUBJECT: Response to Data
           Request Dated 28 Apr 87

2.1. **SURVEILLANCE CATEGORY 1** -

Weighted Probability = 0.026
Source: Estimate developed from DLA-AP Phonecon

2.1.1. **TERMINATE** -

Weighted Probability = 0.010
Source: Estimate

Effort = 2.5000
Source: Estimate

2.1.2. **EXPEDITE** -

Weighted Probability = 0.046
Source: DIMES Standard 2222

Effort = 1.0738
Source: DIMES Standard 2222

2.1.3. UPDATE SURVEILLANCE PLAN -

Weighted Probability = 0.288
Source: DIMES Standard 2222

Effort = 0.5666
Source: DIMES Standard 2222

2.1.4. DELAY REPORT

Weighted Probability = 1.000
Source: Estimate

2.1.4.1. DD 375-2 -

Weighted Probability = 0.253
Source: DIMES Standard 2222

Effort = 0.4862
Source: DIMES Standard 2222

Material Cost = $ 0.02
Source: Estimate

2.1.4.2. DD 375 -

Weighted Probability = 0.345
Source: DIMES Standard 2222

Effort = 1.0484
Source: DIMES Standard 2222

Material Cost = $ 0.02
Source: Estimate

2.1.4.3. MESSAGE DELAY -

Weighted Probability = 0.126
Source: DIMES Standard 2222

Effort = 0.5761
Source: DIMES Standard 2222

Material Cost = $ 0.02
Source: Estimate

2.1.4.4.   LETTER DELAY -

Weighted Probability = 0.080
Source: DIMES Standard 2222

Effort = 0.4485
Source: DIMES Standard 2222

Material Cost = $ 0.24
Source: Estimate

2.1.5.   FILE WORKFOLDER

Weighted Probability = 2.000
Source: Estimate developed from DIMES Standard 2222

Effort = 0.0307
Source: DIMES Standard 2222

2.2.   SURVEILLANCE CATEGORY 2 -

Weighted Probability = 0.110
Source: Estimate developed from DLA-AP Phonecon

2.2.1.   CONTRACT MANAGEMENT ASSISTANT -

Weighted Probability = 1.500
Source: Estimate developed from conversation with DLA-AP

Effort = 0.1244
Source: DIMES Standard 2232

2.2.2.   INDUSTRIAL SPECIALIST ASSIST -

Weighted Probability = 0.750
Source: Phonecon with DCASMA-Baltimore (Norfolk Office)

2.2.2.1.   RECEIVE REQUEST -

Weighted Probability = 1.000
Source: Estimate

Effort = 0.1172
Source: DIMES Standard 2222

2.2.2.2.   OBTAIN ADDITIONAL INFORMATION -

Weighted Probability = 1.000
Source: Estimate

Effort = 0.1710
Source: DIMES Standard 2222

Material Cost = $ 0.25
Source: Estimate

2.2.2.3.   RESPOND TO CMA -

Weighted Probability = 1.000
Source: Estimate

Effort = 0.2609
Source: DIMES Standard 2222

2.3.   SURVEILLANCE CATEGORY 3 -

Weighted Probability = 0.864
Source: Estimate developed from DLA-AP Phonecon

2.3.1.   LESS THAN 12 DAYS -

Weighted Probability = 0.000
Source:

2.3.2.   GREATER THAN OR EQUAL TO 12 DAYS -

Weighted Probability = 1.500
Source: Estimate developed from conversations with DLA-AP

2.3.2.1.   CONTRACT MANAGEMENT ASSISTANT -

Weighted Probability = 1.000
Source: Estimate developed from conversation with DLA-AP

Effort = 0.1244
Source: DIMES Standard 2232

2.3.2.2.   INDUSTRIAL SPECIALIST ASSIST -

Weighted Probability = 0.500
Source: Phonecon with DCASMA-Baltimore (Norfolk Office)

2.3.2.2.1. RECEIVE REQUEST -

Weighted Probability = 1.000
Source: Estimate

Effort = 0.1172
Source: DIMES Standard 2222

2.3.2.2.2. OBTAIN ADDITIONAL INFORMATION -

Weighted Probability = 1.000
Source: Estimate

Effort = 0.1710
Source: DIMES Standard 2222

Material Cost = $ 0.25
Source: Estimate

2.3.2.2.3. RESPOND TO CMA -

Weighted Probability = 1.000
Source: Estimate

Effort = 0.2609
Source: DIMES Standard 2222

2.4. DELINQUENT CONTRACT RECONCILIATION -

Weighted Probability = 1.000
Source: Estimate

Effort = 0.0800
Source: Estimate

2.5. DELAY REPORT RESPONSE (DSC) -

Weighted Probability = 1.000
Source: Estimate

Effort = 0.1600
Source: Estimate

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3. REPROCURE

   Weighted Probability = 0.011
   Source: Estimate developed from conversation with DGSC-PRN

   Cost: $123
   Source: SAMMS implied order cost, DLA-DORO IOM, dated 3 Jul 86,
             SUBJECT: Economic Order Quantity (EOQ) Cost to Order, G608